

REMARKS

The present invention is a method for analyzing a porous rock sample by measuring a wettability of the porous rock sample in the presence of water and oil. In accordance with the preferred embodiments of the present invention, the method comprises determining a water wet pore surface of the sample SM_w and an oil wet pore surface of the sample SM_o when the sample is saturated with water and oil, and calculating a wettability index I_{NMR} from a combination of the water wet pore surface and the oil wet pore surface obtained. In accordance with the preferred embodiments, the wettability index may be obtained from the relationship

$$I_{NMR} = \frac{SM_w - SM_o}{SM_w + SM_o} \text{ or from the relationship}$$

$I_{NMR} = \log_{10} \frac{SM_w}{SM_o}$ where SM_w is the water wet pore surface and SM_o is the oil wet pore surface when the porous rock sample is saturated with water and oil.

The invention has applications for hydrocarbon engineering or development, civil engineering, determining pollution of formations and testing of building materials in order to determine water proofing treatments. See the Abstract and paragraphs [0013] - [0015] of the Substitute Specification.

Claims 21-44 stand rejected under 35 U.S.C. §101 as being directed to non-statutory subject matter. Specifically, the Examiner reasons as follows:

The claimed invention is directed to a judicial exception to 35 U.S.C. 101 (i.e., an abstract idea) and is not directed to a practical application of such judicial exception (e.g., because the claim does not require any physical transformation and the invention as claimed does not produce a useful, concrete, and tangible result). The language in the claim suggest only a combination of instructions without reciting a

structure associated to the procedure and lacks a tangible result and the end of the procedure.

The rejection is traversed for the following reasons.

The Examiner's conclusion that the claims do not require any physical transformation; the invention as claimed does not produce a useful, concrete and tangible result; and the claim language suggests "only a combination of instructions without reciting a structure associated to the procedure and lacks a tangible result at the end of the procedure" is traversed.

In the first place, the rejection of the claims predicated on United States Patent 5,162,733 to Baldwin demonstrates the practical utility and the statutory nature of the claimed subject matter involving measuring wettability of a porous rock.

The Examiner is referred to claim 1 of Baldwin which recites "a method for determining the relative wettability of a sample of porous media with respect to a first liquid and a second liquid" followed by a series of steps which are akin to the subject matter of claim 21 which has been amended to contain the subject matter of claims 22 and 25. In this regard, it should be noted that numerous real-world steps are recited in claim 21 including "wherein the water wet pore surface and the oil wet pore surface is determined when the sample is saturated with water and oil from measurements of relaxation times obtained from the surfaces of the sample placed in a nuclear magnetic resonance device and calculating the wettability index.

Moreover, a series of measurement steps is recited: a) measuring the relaxation times of the water-saturated sample; b) measuring the relaxation times of the sample in the presence of oil and water, in a zone approaching saturation of the sample; c) measuring the relaxation times of the oil in the sample in the presence of water, in a zone approaching saturation of the sample; d) measuring relaxation times

of the sample in a state of 100% oil saturation (all of which involve real world operations). Finally, step e) recites combining measurements of the relaxation times obtained from a)-d) so as to obtain the wettability index which manipulates all of the real world measurements so as to obtain the useful real world "wettability index".

As indicated by the Second Substitute Specification, the wettability index is a useful physical quantity as described in paragraphs [0002] – [0012]. Moreover, the claimed invention is described in paragraphs [0014] – [0016] as having useful applications. The wettability index is a known useful parameter in the field of underground exploration for providing enhanced recovery of a formation by injection of a fluid under pressure using the fluid (liquid or gas) best suited for effluent displacement which is determined by means of preliminary tests as set forth in paragraph [0015] and further, for the evaluation of pollution as set forth in paragraph [0016] of the specification.

In summary, it is submitted that the claimed method for measuring a wettability of a porous rock sample taken from an underground formation as described in paragraph [0013] in the presence of oil and water, followed by the series of steps set forth in claim 21 and concluding with combining the measurements of the relaxation times which are physical times obtained from steps a)-d) so as to obtain the wettability index.

If the Examiner persists in the stated grounds of rejection, it is requested that he specifically address on the record how the claimed subject matter could be considered non-statutory when Baldwin's claimed subject matter is the same nature and further numerous real world steps are recited in the claims to produce the useful wettability index. Moreover, the claimed series of physical steps involved with the

processing of porous rock samples, renders the claims statutory since the physical state of the sample is manipulated during different states of saturation.

The specification stands objected to in Section 1 of the Office Action as failing to "disclose or suggest the step wherein the porous rock sample is obtained from an underground formation containing an effluent; and further comprising determining a fluid suited for a fluent displacement from the analyzing of the porous rock sample; and using the fluid suited for effluent displacement to provide enhanced recovery of the effluent from the formation by effluent displacement." This objection is traversed for the reasons.

While the specification does not provide literal antecedent basis for the aforementioned subject matter of claim 42, it is submitted the processing disclosed in the specification, from the perspective of a person of ordinary skill in the art of such as set forth in paragraph [0013] of the Second Substitute Specification, in combination with the disclosure of paragraphs [0014] and [0015] of the Second Substitute Specification, would place a person of ordinary skill in the art in possession of the claimed invention. Specifically, it is clear that porous rock sample, as described in paragraph [0014] of the Second Substitute Specification, is obtained from an underground source. The whole point of testing porous rock samples to obtain a wettability index turns upon the samples being obtained from the formation which is being inspected. In this regard, the Examiner is referred to paragraph [0015] of the Second Substitute Specification which refers to "the fluid (liquid or gas) best suited for effluents displacement is to be determined by means of preliminary tests" which a person of ordinary skill in the art understands to be support for the claimed "determining a fluid suited for effluent displacement from the

analyzing of the porous rock sample". Moreover, the claimed step of "using the fluid suited for effluent displacement to provide enhanced recovery of the effluent from the formation by effluent displacement" is suggested by the statement in paragraph [0015] "[k]nowledge of various parameters, and notably of the wettability of the rocks, is also useful notably for enhanced recover of a formation, by injection of a fluid [the fluid best suited as a result of the preliminary test] under pressure (emphasis added)". This supports the claimed use of the fluid suited for effluent displacement to obtain enhanced recovery. Accordingly, it is submitted that the subject matter of claim 42 is fully supported.

However, if the Examiner requires, the Second Substitute Specification will be amended in paragraph [0015] to recite precisely the language set forth in claim 42 which, as demonstrated above, is fully supported by the current text of paragraph [0015].

Claims 21-23 and 30 stand rejected under 35 U.S.C. §102 as being anticipated by United States Patent 5,162,733. The claims have been amended to contain the subject matter of claim 25 which had been indicated to be patentable. Accordingly, the rejection of these claims is submitted to be moot.

In view of the foregoing amendments and remarks, it is submitted that each of the claims in the application is in condition for allowance. Accordingly, early allowance thereof is respectfully requested.

To the extent necessary, Applicants petition for an extension of time under 37 C.F.R. §1.136. Please charge any shortage in fees due in connection with the

filing of this paper, including extension of time fees, to Deposit Account No. 01-2135 (612.44794X00) and please credit any excess fees to such Deposit Account.

Respectfully submitted,

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